

Architecture of a Comprehensive Theory

Wayne R. Lundberg
University of Dayton
wayne.lundberg@mailaps.org

$$e^{(i\theta_{\text{mt}}-\lambda)}|\mathfrak{A}\rangle$$

[hep-th/0205176](#)

- Cosmology & astrophysics
 - Relation between General Relativity, 1-brane theory and cosmology
 - Cosmology is cyclic in Mass and Time (Big Bang and mini-inflation) [astr-ph/0007100](#)
 - The “physical singularity” in black holes (dark matter, rivers of gravity)
 - Beyond Dirac
 - SU(3) as a noncommutative 3D matrix algebra (QC/ED) [physics/9712042](#)
 - + SM geometric 1-brane states (oscillating neutrino, *natural* extra dimensions)
- A more detailed presentation is at: http://dpf2002.velopers.net/talks_pdf/154talk.pdf

Figures are provided herein *solely* pursuant to the ‘fair use’ provision of US & International copyright law.
For any other intended use, *contact the author*.

$$e^{(i\theta_{\text{mt}}-\lambda)}|\mathfrak{R}\rangle \rightarrow \text{string theory and general relativity}$$


$$=(\cos\theta_{\text{mt}} + i\sin\theta_{\text{mt}})e^{-\lambda}|\mathfrak{R}\rangle \quad \text{define R-S scale factor } \lambda = f(\mathfrak{R})$$

Fix θ_{mt} , cosmological (*imaginary**) time, to represent the present

regroup and identify:

*ref Steven Hawking's public lecture at the APS centennial

$$=(G_{\mu\nu} + iB_{\mu\nu})|\mathfrak{R}\rangle$$

Yields an **explicit 1-brane** with mass and intrinsic curvature (complex gravity or energy(?)) terms, here \mathfrak{R} represents a generic particle in QC/ED noncommutative matrix algebra 

see [JHEP06\(2000\)044= hep-th/0005015](#)

The sum of the mass & energy of all particles is **finite**, set it equal to 1

$$\sum_U e^{(i\theta_{\text{mt}}-\lambda)}|\mathfrak{R}\rangle = 1 = (\cos\theta_{\text{mt}} + i\sin\theta_{\text{mt}})e^{-\lambda}, \quad \theta_{\text{mt}} \text{ variable}$$

← By gravitational holography, quantum particle states don't cause the sum to diverge: [PRL 89\(8\)/081301](#)

regroup and re-identify:

$$= \frac{G_m^c}{\Lambda g_m} + i \frac{8p}{\Lambda g_m} T_m = 1$$

Yielding a formula for General Relativity which is variable over cosmological (*imaginary**) time-scales

Can re-arrange to get the usual GR equation, except the factor i

see [PRL 87\(14\)/141302= astro-ph/0105317](#)
and [gr-qc/0012094](#)

using Euler's rule yields a result identified as the observed

cosmological formula:

$$\Omega_m + \Omega_\Lambda = 1$$

$$T_n = \ln(T/T_o)/42$$

(x,y,z) curled up

Both axes use R-S scaling

$T_{\text{end}} \cong 200$ trillion years

$$\alpha'/R \leftarrow R$$

Current epoch of mini-inflation [astro-ph/9812133](#)
Dark Energy proposed to be 'residual white holes'
(observed as supernovae and/or burstars ?)

$T_o = 10^{-9} \text{s}$

©'96

(r_R, r_G, r_B) curled up

$M_{p,n}$

Mass- present, normalized

Cyclic cosmology has 9-D space plus 2-D "imaginary time"
(necessary to write boundary conditions for cosmology)

..... $\ln[(M_{\text{univ}} - M_{\text{bh}})/M_n]$: Dark Matter, see [astro-ph/0206264](#)

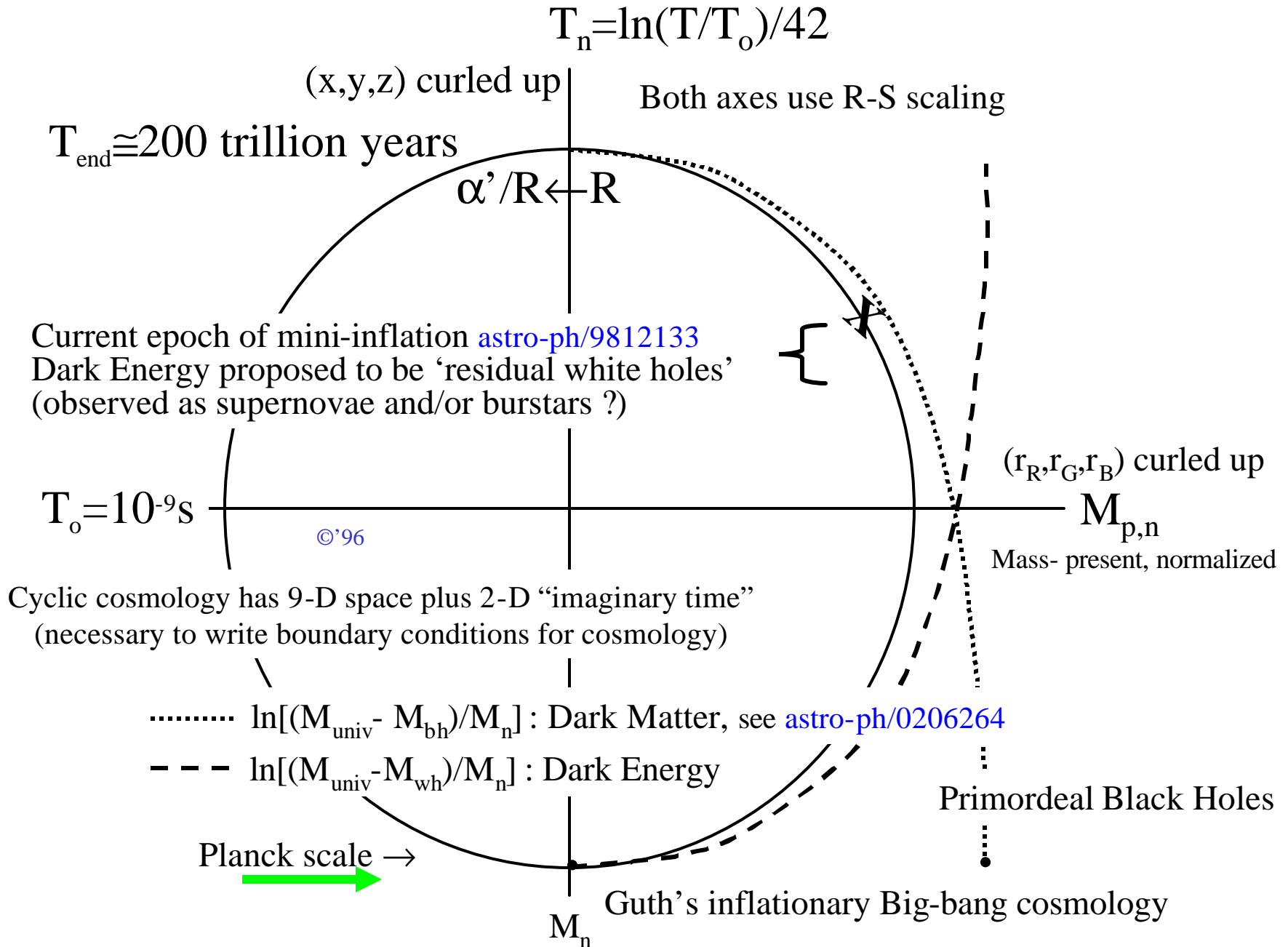
- - - $\ln[(M_{\text{univ}} - M_{\text{wh}})/M_n]$: Dark Energy

Primordial Black Holes

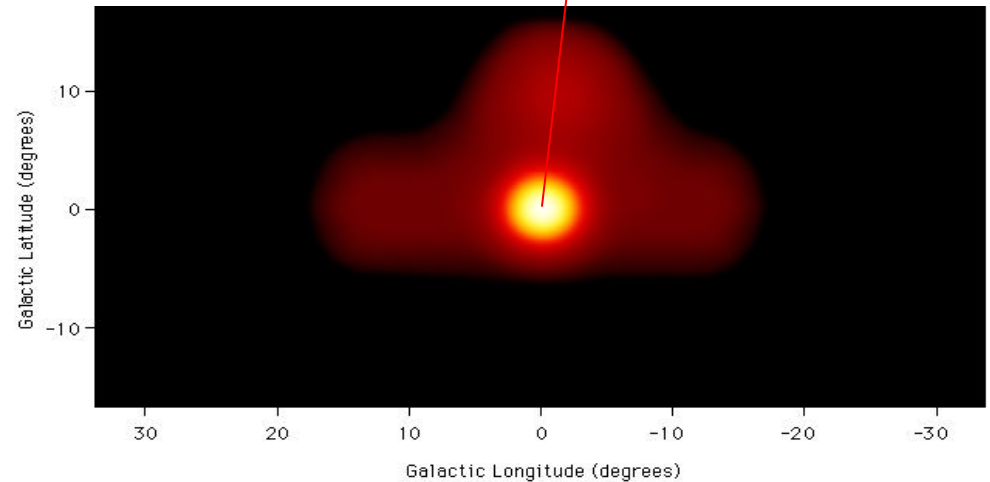
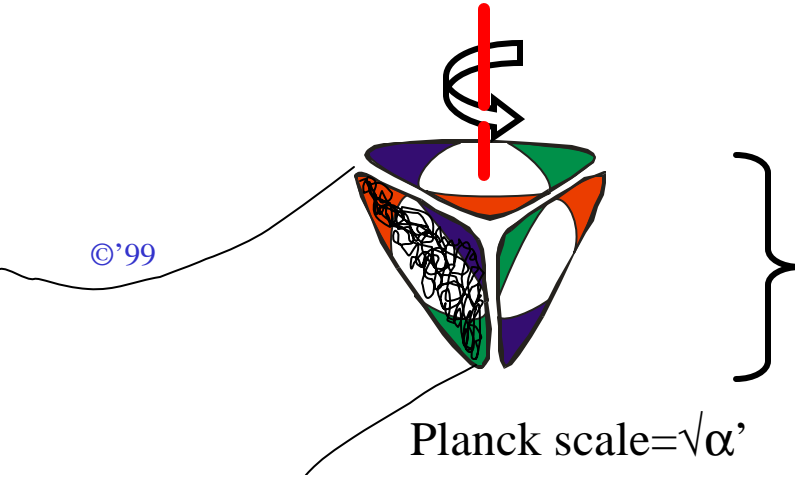
Planck scale →

M_n

Guth's inflationary Big-bang cosmology



Black hole “physical singularity” = minimal object in 3-space



AdS/CFT, Maldacena [hep-th/9711200](https://arxiv.org/abs/hep-th/9711200)

Bilateral asymmetry proposed as the origin of Galactic Annihilation Fountain [astro-ph/9705070](https://arxiv.org/abs/astro-ph/9705070)

Courtesy of D. D. Dixon (University of California, Riverside) and W. R. Purcell (Northwestern University)

$S_{\text{BH}} = \frac{1}{4} \text{Area}$ Bekenstein-Hawking area-entropy law ([hep-th/9601029](https://arxiv.org/abs/hep-th/9601029))

in agreement with Hayward, Mukohyama & Ashworth ([gr-qc/9810006](https://arxiv.org/abs/gr-qc/9810006))

‘entanglement entropy’ when strings (1-branes) are densely entangled on a surface of the tetrahedral physical singularity.

The physical singularity is analogous to a Higg’s boson by considering it as a 4-string interaction vertex, see Kaku ([Phys Rev D 41, p3734, 1990](https://arxiv.org/abs/PhysRevD.41.3734))

...the end of a cosmic string or River of Gravity [astro-ph/0206264](https://arxiv.org/abs/astro-ph/0206264), [/0201058](https://arxiv.org/abs/astro-ph/0201058), [/0206121](https://arxiv.org/abs/astro-ph/0206121), [/0107493](https://arxiv.org/abs/astro-ph/0107493)

Information is *preserved* since each particle is ‘assembled’ or ‘spun’ onto the cosmic string

$e^{(i\theta_{mt}-\lambda)}|\mathcal{R}\rangle \rightarrow$ explicit 1-brane (nee string) theory

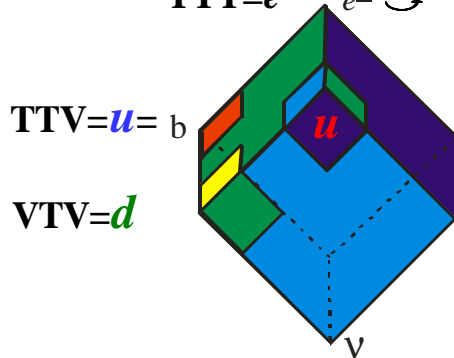
$=(\cos\theta_{mt} + i\sin\theta_{mt})e^{-\lambda}|\mathcal{R}\rangle = (\alpha'_{\mu\nu} + i\zeta_{\mu\nu})e^{-\lambda}|\mathcal{R}\rangle$ defines the Planck-scale unit area (1-brane > Planck scale, Arkani-Hamad, [Phys Today](#)) and a unit of intrinsic curvature

Combinatorial Geometry of the QC/ED 1-brane

Cube images were produced with consent of Seven Towns Ltd, solely for the author's use.

The \mathcal{R} -cube represents QC/ED only when colored as in a QCD color-charge diagram; & it's corner elements are confined to the original positions.

$TTT=e^+ e^\pm \odot$



$TTV=u=b$

$VTV=d$

$1 \leftrightarrow 1$

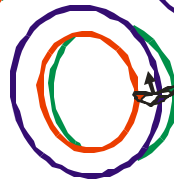
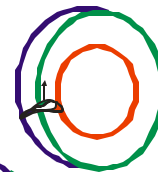
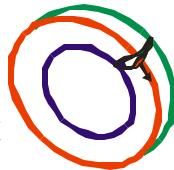
$g \pm 2/3$

u

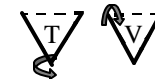
$\mp 1/3$

proton

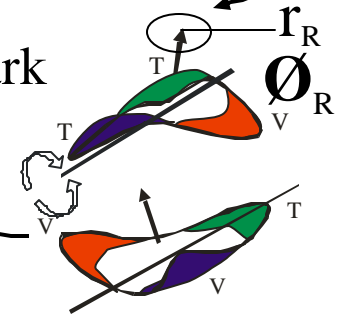
©'83-02



$VTT=u$ quark



d quark



$|H_{\underline{u}du}\rangle = (\alpha'_{\mu\nu} + i\zeta_{\mu\nu})|e^{-\lambda_{3\text{quarks}}}[(G^-CGC^-)(C^-YCY^-)(Y^-GYG^-)]^2\rangle$ ([Orientiworld, hep-th/0109054](#))




(Harari, 1982)

VVV

V_μ



Mass is determined by the cross-sectional area of the 1-brane world sheet, a function of both α' and ζ , with *scalar* $\lambda = \mathcal{I}(r_R, r_G, r_B, \cos\theta_R, \cos\theta_G, \cos\theta_B)$ 

(ref Quantum Gravity,

[PRL \(1990\) V64 p127](#)

& [PRL \(2001\) V87 181301](#))

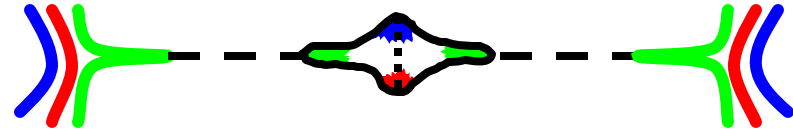
$|H_{\underline{n}_\mu}\rangle = (\alpha'_{\mu\nu} + i\zeta_{\mu\nu})|e^{-\lambda_{v+gluon}}B^2(M^-YMY^-)^2(Y^-CYC^-)^2B^2\rangle$

$$\int \Psi_a^*(r) \Psi_b^*(r) d^3r = \sum \langle a | r \rangle \langle r | b \rangle$$

(ref Shiff, Eqn 23.26')

$$= \Sigma \langle CR^-MG^-R^2 | (YR^-Y^-R)^2 \rangle \langle (RM^-R^-M)^2 | R^2GM^-RC^- \rangle$$

W^\pm, Z^0 in accord with Dirac: only half-spin elementary fermions in nature
<http://www.aps.org/BAPSAPR98/abs/S1130005.html>



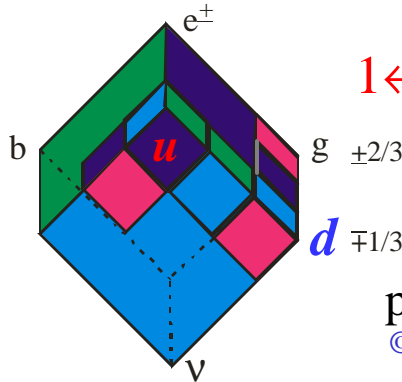
Combinatorial Geometry of the QC/ED 1-brane

Moving cube images can also be produced using Java as a tool for communication of interactions in the QC/ED symmetry group $SU(3) \times SU(2) \times U(1)$.

The combinatorial algebra and geometry of the gluons provides an explanation for the existence of three particle families?

Quark color is identified by *quantized* spin orientation; gluon color exchange requires 'quantum precession'.

The second and third families of particles are thus constructed by quantum precession (bound gluon) on a single quark.

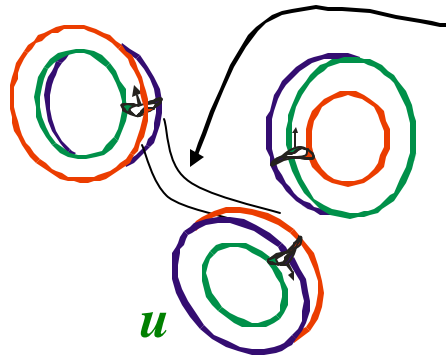


$1 \leftrightarrow 1$

$g \pm 2/3$

$d \mp 1/3$

proton
©'83-02



The geometry of the gluon, as a *long thin strip*, explains the partial success of the **Lund** open-string model (with thickness to model mass)

→ Tripartite 1-brane photon

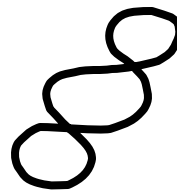
no area ∴ no mass

$$\begin{aligned} |H_{uud}\rangle &= (\alpha'_{\mu\nu} + i\zeta_{\mu\nu}) e^{-\lambda_{3\text{quarks}}} |..\rangle \{ G_{g \leftrightarrow b} = \langle \alpha | \Psi | \beta \rangle = \langle BR^- | e^{-\lambda_{\text{gluon}}} (CB^-C^-B)^2 | RB^- \rangle \} \\ &= (\alpha'_{\mu\nu} + i\zeta_{\mu\nu}) |e^{-\lambda_{3\text{quarks}} - \lambda_{\text{gluon}}} |..\rangle \end{aligned}$$

∴ Necessary & Sufficient extra dimensions



v_τ



Tripartite 1-brane construction of an oscillating neutrino, having naturally and consistently defined mass (hep-ex/9807003)

$$|H_{V_\tau}\rangle = (\alpha'_{\mu\nu} + i\zeta_{\mu\nu}) e^{-\lambda_{v+\mu\text{gluon}}} |..\rangle \langle M^2 BR^- | e^{-\lambda_{\tau\text{gluon}}} MG^-C^2GM^-Y^2 | RB^-M^2 \rangle = (G^{V_\tau}_{\mu\nu} + iB^{V_\tau}_{\mu\nu}) |..\rangle$$